

# Hi-Po Emulsi-D3™



High potency, naturally-emulsified liquid vitamin D3  
for bone health and immune support\*

By David Brady, ND, DC, CCN, DACBN & Caitlin Higgins, MS, CNS, LDN

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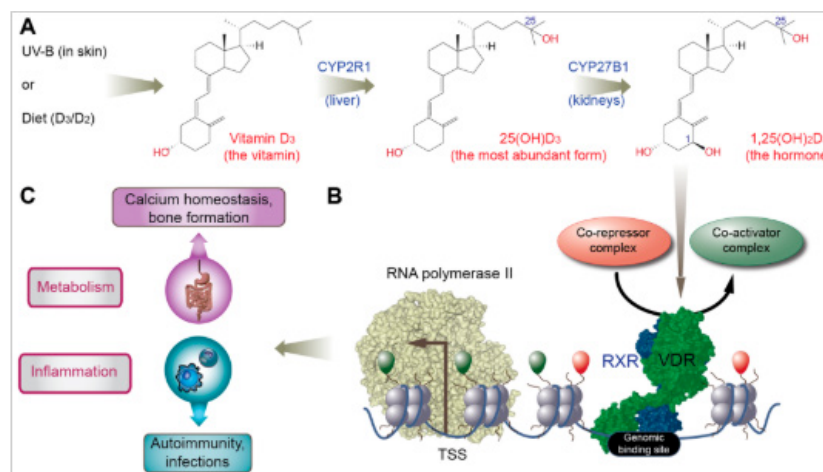
Hi-Po Emulsi-D3™ is a concentrated, highly bioavailable liquid vitamin D formulation offering a broad range of dosage and titration possibilities. Unlike many other liquid vitamin D products available, Hi-Po Emulsi-D3™ is a convenient, pleasant-tasting and easily mixable formula. It can be dropped into any beverage or simply on the tongue, and provides accurate dosing one drop at a time. A natural emulsion technology allows for the production of a 50 mcg (2,000 IU) per drop formula that quickly and completely disperses in liquid. This innovative technology provides enhanced bioavailability, utilizing only naturally-derived ingredients that are free of preservatives and synthetic surfactants.

Although it is classified as a vitamin, vitamin D more closely resembles and functions like a steroid hormone that contributes in multiple ways to the optimal function of human physiology.<sup>1</sup> This fat-soluble vitamin is widely recognized for its critical role in maintaining optimal bone and arterial health, and for supporting proper immune function; however, its function far surpasses this, with many facets likely yet to be identified and elucidated. For example, vitamin D helps regulate phosphorus balance, is needed for cell differentiation, and may also play a role in insulin secretion.<sup>2</sup> Vitamin D receptors are found throughout the body and have been shown to influence the expression of thousands of genes.<sup>3,4</sup> It also plays a role in brain development in early life as well as brain function in adults, which may explain in part the associations between vitamin D deficiency, depressed moods, seasonal disorders, and impaired cognition,<sup>5,6</sup> and the improvements some patients report in these symptoms upon supplementation. In a study that looked at 290 patients with mental illness, 272 (94%) showed clinical vitamin D inadequacy or deficiency (VDID), indicating that deficiency is greater in patients with mental illness than in the general population.<sup>7</sup>

## Benefits of Vitamin D\*:

- Supports bone and hard tissue health
- Helps reduce the risk of osteomalacia/osteoporosis
- Helps regulate gene expression and cellular differentiation
- Helps regulate phosphorus balance in the body
- Supports neurological health and brain development
- Helps maintain immune system balance

Vitamin D3 (cholecalciferol) is synthesized in the skin from cholesterol in response to absorbing UVB rays. It then gets converted in the liver to 25-hydroxycholecalciferol, known as 25(OH)D3, which is the best biomarker for vitamin D status as it is the most stable and abundant vitamin D metabolite in human serum. It finally gets converted into its active hormonal form 1,25 dihydroxycholecalciferol – 1,25(OH)2D3 – in the kidneys.<sup>1</sup> Most holistically-oriented health care practitioners aim for serum vitamin D levels between 50-100 ng/mL as optimal. However, vitamin D deficiency (a level  $\leq$  20 ng/mL) is a major global public health concern, with epidemiological findings showing nearly 1 billion people worldwide to be deficient, while 50% of the population present with vitamin D insufficiency.<sup>8</sup> Many patients will require a higher dose of vitamin D in order to achieve optimal vitamin D status.



Graphic source: Carlberg, C. (2019). Nutrigenomics of vitamin D. *Nutrients*, 11(3), 676. DOI: <https://doi.org/10.3390/nu11030676>

Several factors contribute to the high incidence of deficiency, such as avoidance of sun exposure, older age (the elderly have reduced capacity to synthesize vitamin D in skin upon exposure to UVB radiation and are more likely to stay indoors or use sunscreen), inadequate dietary intake (common among vegans), chronic kidney or liver diseases, malabsorption syndromes such as celiac disease, gastric bypass, cystic fibrosis, inflammatory bowel disease (IBD), chronic medication and alcoholic use, and obesity.<sup>8</sup> Individuals with darker skin color may be genetically adapted to require more sun exposure than those with lighter skin; individuals of African, Middle Eastern, and Hispanic ancestry have higher rates of deficiency compared to Caucasians.<sup>8</sup> In fact, vitamin D deficiency in African Americans was 82% compared to the U.S. national average of 42%.<sup>9</sup> Additionally, modern diets are typically lower in vitamin D-rich foods that were once a more regular part of people's diets, such as fatty fish, cod liver oil and lard from pasture-raised pigs. Prolonged and severe vitamin D deficiency leads to rickets in children and osteomalacia in adults. Vitamin D2 (ergocalciferol) is the form typically used in food fortification, but evidence indicates that D3 is far more effective for raising and maintaining serum 25(OH)D concentration and that D2 should not be considered equivalent.<sup>10,11</sup>

## Supplement Facts

Serving Size 1 drop  
Servings Per Container 1,000

Amount Per Serving	% Daily Value	
Vitamin D (as Cholecalciferol)	50 mcg (2,000 IU)	250%

**Other Ingredients:** Vegetable glycerine, water, medium chain triglycerides, vitamin E.

### Vitamin D and Bone Health

Vitamin D assists with proper bone and tooth health and is important for cellular metabolism, as it controls calcium homeostasis. Vitamin D facilitates intestinal calcium absorption and reduces calcium excretion by the kidneys, providing calcium necessary for bone mineralization. Vitamin D is vital for normal growth and development in children and adolescents with peak bone mass occurring in the late teenage years, increasing about 40 times from birth to adulthood.<sup>12</sup> The risk of osteoporosis has its roots in childhood and adolescence, as the rate of cortical bone remodeling is as high as 50% per year in young children.<sup>12</sup> A recent meta-analysis suggests that older adults who are at increased risk for fractures and/or vitamin D deficiency would benefit from supplementing with 800 - 1,000 IU vitamin D per day.<sup>13</sup> In healthy postmenopausal women with low 25(OH)D and high parathyroid hormone (PTH) levels, 3 months of 2,800 IU of daily vitamin D3 significantly increased serum vitamin D levels, reduced PTH levels, and significantly improved bone strength and trabecular thickness in the tibia, and volumetric bone mineral density in the trochanter and femoral neck compared to the placebo group.<sup>14</sup>

### Vitamin D and Healthy Immune Function

Vitamin D is essential for immunity, as it modulates the response of the innate and adaptive immune system via vitamin D receptor (VDR). VDR is the key transcription factor in differentiating lymphocytes within the bone marrow into monocytes and granulocytes.<sup>15</sup> Via toll-like receptors and macrophages, vitamin D stimulates the recognition of bacterial pathogens in monocytes and inhibits *M. tuberculosis* proliferation.<sup>15</sup> Vitamin D is able to regulate Th1 and Th2 lymphocyte balance and downregulate the expression of inflammatory cytokines overall. 1,25(OH)D3 has been shown to heavily influence and shift dendritic cells' and macrophages' intracellular metabolism, metabolically reprogramming their role in inflammation and autoimmunity by altering these cells' phenotypic expression.<sup>16</sup> In fact, research shows that priming of naive CD4+ T cells with vitamin D-treated tolerogenic dendritic cells induces T-regulatory cells that dampen chronic inflammation that could prevent or reverse autoimmune processes.<sup>17</sup>

For those with chronic inflammatory conditions (e.g., food allergy, IBD, eczema), daily vitamin D supplementation may be a critical application for enhancing optimal health and quality of life, beyond the goal of repletion. In a retrospective review of children ages 3-16 with IBD and vitamin D deficiency, 3 months of high dose oral vitamin D3 supplementation significantly improved inflammatory markers and disease activity scores associated with IBD, significantly increased 25(OH)D levels, and normalized serum calcium levels.<sup>18</sup> Anxiety and mood disorders have the ability to weaken the immune system. In diabetic females with anxiety and vitamin D deficiency, high-dose supplementation every two weeks for 4 months significantly improved mood status, decreased high-sensitivity C-reactive protein levels and increased the anti-inflammatory cytokine interleukin-10 in serum.<sup>19</sup>

#### Recommended Use:

- As a dietary supplement, take one drop per day, or as directed by your health care practitioner.
- Although hypervitaminosis D is rare, there is a potential for toxicity with long-term, very high daily supplementation. Serum 25(OH)D levels greater than 100 ng/ml may be a sign of over-supplementation of vitamin D3.<sup>20</sup>

*For a list of references cited in this document, please visit:*

[http://catalog.designsforhealth.com/assets/itemresources/Hi\\_Po\\_Emulsi\\_D3\\_References.pdf](http://catalog.designsforhealth.com/assets/itemresources/Hi_Po_Emulsi_D3_References.pdf)

\*These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent any disease.

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